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EXPERIMENT STATION,

BULLETIN No. 1.

ENSILAGE.

APRIL, 1888.

ENSILAGE.

The first investigation of ensilage made on the Agricultural College farm was in 1886. During the past year this work has been very much increased in amount and scope. Very few, today, doubt the economy of ensilage as food for farm stock, but there are a variety of opinions concerning the methods of production and storing of this valuable food. Many small or medium farmers are rejecting the silo, not for lack of faith in it but for a supposed lack of means. My object, in this work of investigation, was not, therefore, especially planned for the wealthy farmer, with large farm and stock, but rather for that larger class who till small areas, and whose plans must recognize the financial factor, the cost of equipment.

A few of the questions asked were:

1st. Are costly silos of masonry necessary?

2d. Can green crops be stored whole?

3d. Is rapid filling necessary?

4th. Is there any advantage to be gained by selecting the variety of corn planted?

1st. Experience demonstrates that a silo of forty to seventy tons capacity can be built in a section of almost any barn at a cost of one dollar for each ton, or for forty to seventy dollars. This pays for the lumber, the labor, and all materials used. On farms where there is an abundance of lumber, and stone for foundations. the *cash outlay* for a one hundred ton silo need not exceed $25.00 for materials, saw bill, etc.,

and 10.00 for labor, supposing the team work done by farm team,

or $35.00 for a one hundred ton silo. First cost of silo, then, need not deprive any farmer of the benefits of ensilage.

2d. The experience of the past two years, both on the College farm and among others who have tried the system, has clearly shown that corn may be stored whole in the silo, giving, in many respects, a better preserved ensilage than when cut into

inch or half inch lengths. My position on this point is precisely what it was one year ago, namely: To those that have power, whether horse or steam, and who do not object to having a few hundred dollars invested in extra machinery, I would say, cut your ensilage! it is more convenient to feed, it comes out of the silo with less labor, the extra cost in storing will be offset by the convenience in handling, *and, in case of rank growing corn*, of the Western or Southern varieties, by decreased waste in feeding; to those who have no conveniences for cutting and who are hesitating to invest in the needed machinery, I would most emphatically say, build a silo and fill it with whole corn, packing carefully, and you will have a first-class article well preserved, and if the corn is of medium growth little will be wasted in feeding; no farmer should hesitate, for a moment, if the case has resolved itself into a question of whole ensilage or no ensilage, in fact, I feel certain that, in many cases, even when a machine could be hired to come at the right time and cut the corn, it would prove unprofitably from the financial point of view alone.

3d. Rapid filling is not only unnecessary but it is objectionable, for two reasons: first, to the average farmer it means the hiring of considerable outside help, both of men and teams, and, second, I am satisfied that better ensilage, whether whole or cut, will result from slow filling than from rapid.

4th. The question as to whether there is an advantage in selecting seed for ensilage corn is one of great importance and one that has been too much neglected; there was a time, not wholly past either, when *bulk* and *weight* were the only measures of value that were supposed to apply to ensilage crops. *Tons per acres*, regardless of *feeding value per ton*, were regarded as the best indication. This is wrong, and to-day the most experienced users are finding that immature, watery varieties, though standing higher on the scale of *tons per acre* are really lower on the true scale of *feeding value in the manger*.

The general scope of our work for 1887 was as follows: To determine the most valuable variety of corn for our climate and locality; to compare the cost of production and feeding value of such varieties; to note the relation of crop composition to degree of maturity; to compare the relative cost of harvesting corn, both for cut and whole ensilage, and for the crib and fodder stack; to determine the relative exhaustion of the soil occasioned by the varieties experimented with.

As the work progressed other lines of inquiry presented themselves, many of which could not be worked out for lack of time and means.

Four varieties of corn were selected. One, a white Southern, or dent corn, widely sold as an ensilage corn; another, a dent variety, sent out two years ago by the Department of Agriculture, known as the "Pride of the North," originating in Minnesota; a third, known as the "Sanford" corn; and the fourth variety, a common twelve-rowed corn, producing a large growth, both of fodder and ears. This latter corn is a variety which, in ordinary corn years, will mature well for husking.

Five acres of land, in one field, were selected for the work. A part of the land was sod land, broken in the fall, and the remainder had been in winter rye and millet the previous year. The rows were so arranged as to give each experiment the same relative proportion of sod and old land. The field was divided into two parts and duplicate rows were arranged on each half; also, one half was fall manured and the other half in the spring.

The following statement shows the cost of producing an acre of ensilage on this field:

	TOTAL FOR FIVE ACRES.		
Plowing,	$6.50		
Replowing in spring,	1.50		
		$8.00	
Drawing and spreading manure (on north half) thirty-five loads,		7.50	
Drawing manure into heap in winter (south half),	$6.50		
Moving manure from heap (south half),	2.70		
Drawing manure from yard (south half),	6.00		
		$15.20	
Spreading,		1.50	
Harrowing,		6.50	
Marking for planting,		1.50	
Planting,		2.40	
Applying fertilizer,		.87	
Total cost of labor up to the time seed was in the ground,			$43.47
Harrowing after corn was up (3 times over),		$1.65	
Cultivating,		6.07	

Hoeing by hand,	9.74	
		$17.46
Total labor from plowing to harvesting for 5 acres,		$60.93
Total from plowing to harvesting per acre,		12.19

The cost of harvesting varied with the yield per acre and the method of harvesting, and will, therefore, be given for individual acres rather than for the whole five.

One acre planted with the Southern corn, with the ensilage cut into three-fourths inch lengths, cost as follows:

Cutting and loading,	$5.56	
Drawing into barn,	4.68	
Cutting and packing,	11.97	
Cost of harvesting per acre,		$22.21
The yield was 20.45 tons, or a cost per ton of		1.08

With the Sanford corn the cost was:

Cutting and loading,	$3.76	
Drawing,	3 15	
Cutting and packing,	8.37	
Total for harvesting,		$15.28
Yield per acre 15.31, or cost per ton for harvesting,		1.00

With the Pride of the North the yield was 12.54 tons, and the cost of harvesting per ton, $1.24.

The Northern field gave us 16 tons, cost for harvesting, $1.00.

The rule for charging the cost of manure is not a definite one, and varies among various writers. Some charge the whole cost of manure applied, others one-half or one-third.

In my work I have followed a three years rotation and charge the total value of all manure used equally to the three crops, thus one-third of the total application stands charged to the ensilage. The following figures show the value of all manure and fertilizers used on the five acres:

31.7 cords farm yard manure at $3.00 per cord,	$95.10
1,000 lbs. fertilizer, at $1.90 per cwt.,	19.00
Total for five acres,	$114.10
Or per acre,	22.82

The interest on land is divided each year, as two crops are produced. Each is charged one-half interest on value of an acre

of land; the cost of seed is charged to each crop. These factors cover the whole cost of producing ensilage, from the turning of the first furrow to the weighting of the silo.

The following recapitulation gives this cost, both per acre and ton, of product:

Labor, up to harvest time, per acre,	$12.17
Labor harvesting,	22.21
Cost of manure, $22.82, (one-third charged to this crop),	7.61
Total per acre,	$41.99
Yield 20.45 tons; cost per ton,	$2.05
Add interest and value of seed used,	.16
Gives whole cost per ton of Southern corn ensilage as put into the silo,	$2.21

Apply the same summary to the Sanford corn and the cost complete becomes, $2.48.

With the Pride of the North it is $3.07, and with the Northern field corn, $2.40.

The following table will give a comparative statement of the yield and cost of the four varieties:

	Yield per acre in tons.	Cost per ton.
Southern corn,	20.45	$2.21
Sanford corn,	15.31	2.48
Northern field corn,	16.00	2.49
Pride of the North,	12.54	3.97

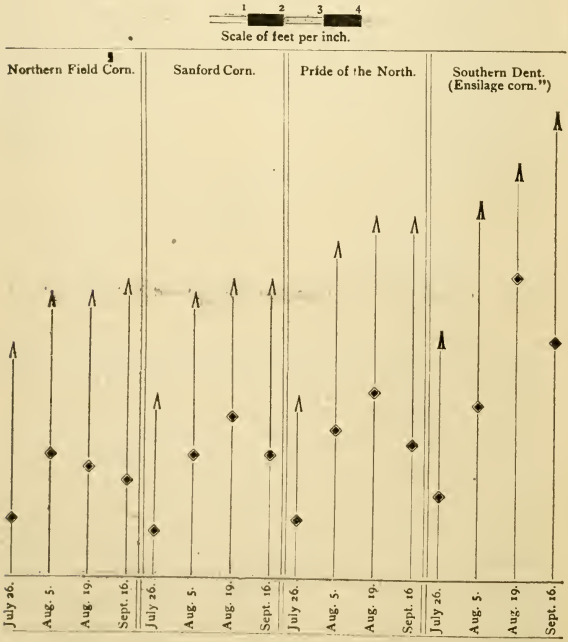
Here we have varieties of corn producing ensilage in varying quanties per acre and at varying prices, and the problem which the practical man desires solved is this: Is there any one variety better than the others?

There is but one way to finally settle such a problem, and that by *feeding* the different kinds and noting the product, whether beef, milk, or butter. But alongside of this feeding it is of great value to know the chemical composition of the crop.

July 26 samples were taken from each variety of corn. Five average stalks were cut up, their weight, height and degree of development carefully ascertained and recorded; four stalks of each of these varieties were hung up in a dry attic to air dry, the other stalk was taken to the laboratory cut up and the per cent of water determined. The part not used in this water determination was dried and bottled for future analysis.

August 5 another set of samples were taken in the same way, and again, on each of the following dates, namely, August 19 and September 16. This gave samples of each variety at different dates, enabling a comparison of the varieties at the same date, and of the changes in development and composition at given intervals.

The following graphical table shows the height of the corn in feet at the intervals mentioned, as well as the weight per stalk in ounces, the whole length of vertical line representing feet on the scale of 1 inch equals 4 feet, or ¼ inch equals 1 foot, while the character (◈) represents the weight per stalk, in ounces, ⅛ inch in vertical height equals 4 ounces.



This shows that the ensilage corn did not reach its full development in height until September 16. The Pride of the

North attained its full height August 19, and the Northern Field and Sanford, Aug. 5.

In general the weight per stalk increased in about the same ratio as the height until August 19, while after that, and until September 16, in each variety there was a falling off in weight, caused, no doubt, by a loss of water in the stalks.

September 16 the height of the

Southern corn was	12	ft.,	weight per stalk,	47	ounces,
Pride of the North was	9½	ft.,	"	"	27.8	"
Sanford was	8	ft.,	"	"	27.6	"
Northern Field was	8	ft.,	"	"	22.4	"

The degree of maturity, as shown by the various external changes, such as tasseling, throwing out silk, blistering of kernel, kernel in boiling stage, and maturity of kernel, were all recorded, and in the following table are given the date at which these several stages were reached by each variety:

Kind of Corn.	Greatest		Date of				
	Height.	Weight.	Tasseling.	Silking.	Kernel Blister'g	Kernel full.	Kernel Matur'd
Southern,	Sept. 16	Aug. 19	Aug. 19	Aug. 19	Sept. 16	Sept. 25	
Northern Field,	Aug. 5	Aug. 5	July 26	Aug. 5	Aug. 5	Aug. 19	Sept. 16
Sanford,	Aug. 19	Aug. 19	Aug. 5	Aug. 19	Aug. 19	Sept. 16	Sept. 20
Pride of the North,	Aug. 19	Aug. 19	Aug. 5	Aug. 5	Aug. 5	Aug. 19	Sept. 20

It will be observed that in all but the Minnesota corn (Pride of the North) the time of maximum weight and "silking" were the same, hence, so far as *tons per acre* are concerned, the crop could have been cut at that time to the best advantage. The period between "silking" and "full" kernel, or when in the boiling stage, was as follows: Southern corn, thirty-seven days; Northern field corn, fourteen days; Sanford, twenty-eight days; Pride of the North, fourteen days.

The Pride of the North is a dent corn, which is but little behind the flint variety grown in this region, and it matures its seed very well in favorable seasons, the small yield is against it, however. The Northern flint lead the varieties in earliness and, as will be seen by the yield per acre, was not exceeded by any except the Southern corn.

It appears that while the Sanford was from ten to fourteen days later than the Northern field, it was well matured by September 15, and produced practically the same weight per acre at nearly the same cost per ton.

The samples taken September 16 were divided into stalk, ear, husk, and leaves, and weighed, with the results given below:

Variety	Stalk.	Ear	Husk.	Leaves.	Total.	Ratio of leaves to stalk.	Ratio of ear to total wei't.
	oz.	oz.	oz.	oz.	oz.		
Southern,	15⅛	6⅝	4⅞	8	34⅝	1 : 1.9	1 : 5.2
Northern Field,	9¼	7¾	1¼	4⅛	22⅜	1 : 2.2	1 : 2.9
Sanford,	11	2½	2	4⅛	19⅝	1 : 2.7	1 : 7.8
Pride of the North,	9	7	3¼	4½	23¾	1 : 2	1 : 3.4

This table is not based upon enough weighings to be taken as a standard, and is, in a measure, misleading, for example, the Southern corn appears more leafy than any other variety, but the thick base of the leaves encasing the stalk are much longer in this variety, and being very thick bring up the weight of the leaves. This may be an advantage, or the reverse, according as this part of the leaf is richer or poorer in nutriment, a question which I find no information on. Chemical analysis would show this, but this line of inquiry was, from necessity, left for future investigation.

In the case of the Sanford corn, I am of the opinion that the proportion between the total weight and the weight of ear is too small to represent a true average.

In the case of the Northern field and Pride of the North the ratio of ear to total weight is very nearly correct as was shown by husking a part of the corn later.

CHEMICAL COMPOSITION OF CROPS.

The samples taken at the date above mentioned were analysed by Dr. Burleigh, with the results given below:

Date.	Southern.		Northern Field.		Sanford.		Pride of North.	
	Water.	Dry substance.	Water.	Dry substance.	Water.	Dry substance.	Water.	Dry substance.
July 26,	91.25	8.75	87 75	12.25	90.85	9.15	90 65	9.35
Aug. 5,	89.18	10.82	86.10	13.90	86.79	13.21	87.56	12.44
Aug. 19,	84.95	15.05	81.45	18 55	86.75	13.25	82.25	17 75
Sept. 16,	75.40	24.60	72.40	27.60	77.20	22.80	70 45	29.55

The increase of dry substance, which is the only part of value as food, in the ordinary acceptation of the word food, is exhibited in the following tabular form:

Per centage increase of dry substance in growing corn

Variety.	From July 26 to Sept. 16.	From Aug. 19 to Sept. 16.
Southern,	181 per cent.	63.4 per cent.
Northern field corn,	125 per cent.	48.8 per cent.
Sanford,	149 per cent.	72.0 per cent.
Pride of the North,	216 per cent.	66.4 per cent.

These figures must be taken in connection with the last table, as they show the per centage of increase and not the absolute gain, thus the gain on the Northern field corn from July 26 to September 6 is 125, but on July 26 the Northern field corn had 12¼ per cent of dry substance, while the Southern corn had only 8.75.

Comparing the dry substance in one hundred pounds of corn at the several dates and we shall find the following to be true:

	Gain of dry substance from July 26 to Sept. 16.	Aug. 19 to Sept. 16.
Southern,	15.85 lbs.	9.55 lbs.
Northern field,	15.35 lbs.	9.05 lbs.
Sanford,	13.65 lbs.	9.55 lbs.
Pride of the North,	20.20 lbs.	11.80 lbs.

So that while the per cent. of increase varied widely the actual gain per hundred pounds was nearly identical in three of the varieties.

The following table shows the complete analyses of the four varieties, as sampled September 16:

	Water.	Dry substance.	Albumenoids.	Nitrogen free extract.	Ether extract	Fibre.	Ash	Ash contain'd	
								Phosphoric acid.	Potash.
Southern,	75.40	24.60	2.36	14.58	0.58	5.05	1.13	.0269	.0317
North'n Field,	72.40	27.60	2.65	17.17	1.30	4.79	1.69		
Sanford,	77.20	22.80	2.11	13.85	1.08	4.81	.93		
Pride of the North,	70. 5	29.55	3.25	16.90	1.59	6.04	1.77	.0888	.0342

From these figures we may compute the total amount of each constituent produced per acre, obtaining the following:

	Dry substance.	Albumenoids.	Nitrogen free extract.	Ether extract.	Fibre.	Ash.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
Southern,	10000	965	5961	236	2435	463
Northern Field,	8832	848	5497	415	1532	549
Sanford,	6880	646	4247	330	1470	286
Pride of the North,	7411	815	4239	397	1516	444

If we accept the chemical composition as a true basis of value the twelve and one-half tons of Pride of the North would be more valuable than the fifteen and one-third tons of Sanford, and nearly as valuable as the sixteen tons of Northern field corn, but no test that stops short of the feeding barn can be decisive, and we will, therefore, defer all discussion of this point until a subsequent "Bulletin on Feeding."

It is to be noted that the Southern corn did produce more dry substance per acre than any other variety; it should be remembered, however, that while the Southern corn produced twenty-seven per cent. more gross weight as harvested it produced but fourteen per cent. more dry substance than the Northern field corn, and reducing the cost per hundred pounds of dry substance into a comparable form we find it to be $0.448 for the Southern, and $0.434 for the Northern.

Ensilage shrinks in the silo, so that the number of tons available for feeding is less than the total amount harvested.

Last year the shrinkage for whole corn ensilage was twenty per cent for Southern corn.

This year the Southern corn cut, not whole, shrunk 16.5 per cent., the Sanford cut 5.5 per cent., and the Northern, put in whole, 23 per cent.

COST OF FILLING, WHOLE OR CUT.

Our ensilage corn in 1886 was an average distance of forty rods from the silo, and in 1887 it was fifty rods away, so that the cost of filling is comparable. In 1886 the Southern corn was put in whole, the yield was twenty-two tons per acre, and the cost of harvesting was fifty-five cents per ton. In 1887 the cost was $1 08, the yield per acre being twenty and one-half tons. This extra fifty-three cents represents the additional cost for cutting,

In 1886 the cost per ton of harvesting the field corn ensilage was sixty-one cents when put in whole, while in 1887 the cost, when run through the ensilage cutter, was one dollar.

Or if we confine the comparison to the past year's work we have the cost of harvesting a field of ensilage not included in the experiments upon which this Bulletin is based. This field is two hundred rods from the barn and would, therefore, be at a disadvantage as compared with the field averaging but fifty rods distant.

The cost of harvesting the *whole* ensilage on the field two hundred rods from silo was 60.7 cents per ton. The cost of harvesting the *cut* ensilage on field fifty rods distant was $1.00 per ton.

The yield in each case being practically alike, had the former field been but fifty rods away I believe the cost could have been reduced from 60.7 cents as low as 50 or 55 cents. In general we may say that, so far as our experience goes, it will cost

from forty to fifty cents extra per ton to run it through the cutter, and a part of this comes from the fact that more teams and men are needed, and the wasted time becomes considerably greater, even with the most careful planning.

THICK OR THIN PLANTING.

A part of our plan covered the point of seeding, and while the results obtained are not in accord with the views of many careful and intelligent ensilage users they are, nevertheless, the results that the scales gave and, while not conclusive, are certainly better than an unsupported opinion.

One question intimately connected with this cannot be discussed in this Bulletin for lack of date. I refer to the effect of thick planting upon *quality* of product.

The Sanford corn was planted as follows: Four rows on south half of field, seeded thin (sixteen quarts per acre). Duplicate rows were planted on the north half of field, but two of these were seeded thin, (sixteen quarts), and the other two thick, (thirty-two quarts per acre).

The yield, computed per acre, was as follows:

South half of field, thin seeding, 13.44 tons.
North half of field, thin seeding, 15.72 tons.
North half of field, thick seeding, 18.67 tons.

The Pride of the North was also planted in two ways, the north half seeded at the rate of sixteen quarts per acre, and the south half thirty-two quarts per acre. The yield was, for the thin planting, 11.52 tons, and for the thick planting, 13.51 tons.

The conclusion, so far as any can be drawn from this statement, must be that thick seeding will give greater yields per acre than thin, but further investigation may show that the quality is inferior.

The silo is one of the few additions to our agriculture that is applicable to men of limited means, and is, at the same time, within their reach.

Agricultural machinery, or thoroughbred stock, though greatly needed by all, are often beyond the means of the farmer tilling small areas, the expense being out of proportion to the income. But a silo is just as available and just as valuable to the farmer keeping five head of cattle as it is to the possessor of a hundred, hence, the importance of thoroughly establishing a ra-

tional and economical system of producing and storing this kind of food.

The following directions for establishing the system upon either small or large farms may aid those wish to commence the present year. The capacity of the silo must first be determined, and this is dependent upon the number of cattle to be fed. For our climate we must count upon barn feeding for two hundred days, and at fifty pounds of ensilage per day we shall need five tons per animal; this amount will be sufficient for a full sized cow or ox. Young cattle need less, but with the shrinkage and waste five tons is a sufficiently close estimate. For twenty cattle, therefore, one hundred tons are needed. Having decided on the amount needed, the question arises, how great a space is needed to hold this amount. No definite answer can be given to this, as the space required per ton varies with the size of silo and the depth. Fifty cubic feet will contain rather more than a ton in siloes of seventy to one hundred tons capacity, so that our silo to hold one hundred tons might be 15x15 feet and thirty feet high, the extra space being necessary, as it is impossible to fill a silo so as to have it more than three-fourths full when settled. A better shape for a one hundred ton silo would be 20x20 feet and sixteen feet high; the dimension for a fifty ton silo might be 12x15x16 feet; a twenty-five ton silo, 12x12x12 feet; a twenty ton silo, 10x10x12 feet.

HOW TO CONSTRUCT.

If economy is to be practiced, select a section or joint in the barn, remove floors, and if there is a barn cellar place sills on the bottom of this and set 2x8 scantling vertically, bringing the inside edges even with the sills of the barn. The bottom may or may not be cemented, according as the ground is wet or dry. If to be cemented, three casks of cement and an equal amount of sharp sand or gravel will cover a bottom 16x16 and turn up on the sides two feet, which will give a tight silo. Common spruce or hemlock boards, square edged and planed on one side, are the best for boarding the inside of the silo; these are to be put on in two courses, breaking joints, and if thoroughly nailed will give a tight pit. No tongueing or matching is needed. Tarred paper may be put between the boarding, if desired, but I doubt if it is of great utility. At some point, most easily accessible, an opening, extending nearly the height

of the silo, must be made to put in the corn and take out the ensilage. The courses of boards should be cut shorter than the opening to allow loose boards to be set in, lapping on the door studding and making an air-tight joint.

For all this work medium lumber is good enough, and a very limited amount of mechanical skill and a few tools, which all farms should have, will enable most farmers to build their own silo. A few iron rods, one-half inch in diameter, may be necessary to prevent spreading by side pressure, but this will depend upon the strength of the original frame of the barn.

Narrow boards, from five to eight inches wide, are better than wide ones, as they are not likely to swell and split. Eight penny nails for the first boarding and twelve penny for the second course will hold the boards in place.

A silo, constructed as above outlined, will cost from fifty cents to one dollar for each ton of its capacity, according as all materials, including lumber and stone, are charged, or only labor and nails, rods and cement.

RAISING THE CROPS.

Sod land fall plowed and, if possible, fall manured, will produce the best results generally, but this point is not of great imtance. The location of the field is to be considered. Land that is near the silo is very desirable. We have only to remember that an acre will produce from twelve to twenty loads which must be conveyed to the barn to appreciate the importance of nearness. The land should be well manured with from ten to fifteen ox loads of good farm yard manure and, in addition to this, it will pay to apply two hundred pounds of some concentrated fertilizer in or on the drills or hills. A fertilizer containing a good per cent. of potash is desirable, and this may be secured in the following mixture of chemicals which may be bought from any wholesale fertilizer manufacturer:

Dissolved bone black,	250 lbs.,	cost about $10.00.
Muriate of potash,	200 lbs.,	
Sulphate of ammonia,	50 lbs.,	
	500 lbs.	

Such a fertilizer would give the following analysis:

		Average analysis of ten prepared fertilizers.
Nitrogen,	2 per cent.	3 per cent.
Soluble phosphoric acid,	8 per cent.	11¾ per cent.
Potash,	20 per cent.	2¾ per cent.

I have given the average of ten of the best fertilizers to show wherein they differ from the above mixture.

The quantity of land needed will depend upon the capacity of the silo. On average land from twelve to sixteen tons may be considered an average yield per acre.

No unvarying rule can be given for the selection of the variety of corn best adapted for ensilage, the climate of the given place must largely determine this, but my rule has been to select some variety of corn that will, in average years, mature sufficiently to bring the kernel into the "roasting stage," that is, so far perfected that the interior of the kernel is past the period of milky consistency, and, if a flint variety, is well towards the time of "glazing," or "specking," externally. By this rule a corn that would be abundantly early for southern New Hampshire might not develop sufficiently for Grafton county, hence, each locality must select corn adapted to its own wants.

I cannot advise any one to buy the Western or Southern corn, which, in the best of seasons, does not more than reach the period when its kernel is filled with a watery fluid, such corn contains too much water and too little nutriment, or dry substance. It is by no means a bad practice to plant precisely the same variety of corn as is used for planting fields intended to be husked, for when this practice is followed the amount put in the silo may be varied and the remainder, whatever the amount, may be stooked for husking.

The quantity of seed per acre must be left largely to the judgment and experience of the farmer. Our practice on the College farm has been to plant in rows three feet two inches apart, using twelve quarts of Northern seed corn per acre, when intended for husking, and sixteen quarts of seed when intended for the silo. With the Southern corn thirty-two quarts per acre is used, and with the Sanford corn sixteen quarts. These quantities have given us satisfactory results. Many others, however, use less seed and a few use more.

The cultivation of the crop is a matter of some importance, for the cost of the product depends largely upon the amount of labor expended. In many cases, where the land is comparatively free from stones and strawy manure, a light smoothing harrow may be profitably run over the land just as the corn is pricking through the soil, and again when two or three inches high. After this the cultivator or horse hoe should be run often and

until the corn is two feet high; where there is little "witch grass" (also known as Couch grass, Scotch grass, etc., etc.,) no hand hoeing is necessary, but with an abundance of this troublesome grass once through with the hand hoe is necessary.

HARVESTING.

Harvesting should commence in season to secure most of the crop before the first hard frost; no man can tell when this will be, and so no rule can be given. A light frost does not materially injure ensilage, but a heavy one probably works injury, especially if the corn is allowed to stand long.

The method of harvesting depends upon the way in which the ensilage is to be stored. When there is lack of machinery for cutting, or when it is desired to try ensilage one year before investing in a full outfit, packing whole will give a nice quality of ensilage and will necessitate no extra outlay in harvesting, the ordinary help on the farm and the usual team will fill the silo fast enough, in fact, it may sometimes be necessary to wait for the temperature in the silo to rise, for I am convinced that it should be as high as 130° each day before a new lot is added. This method of whole filling is so simple, so entirely within the reach of all, and so satisfactory when practiced that I am forced to say, that were I to provide a silo on a farm of my own I should most certainly plant a variety of Northern corn, capable of producing twelve to fifteen tons of well matured corn per acre, and should pack it whole, allowing the temperature to keep as near 140° as possible while being packed.

There is another advantage in starting with whole ensilage, even if it proves unsatisfactory the first year, the cutter and power can be secured later for the second year, and there is nothing wasted, no outfit to throw aside, every dollar invested for the whole ensilage equipment is needed when the change is made, hence, there is no risk. On the other hand, if the whole ensilage does give satisfaction, then the extra outlay for machinery and the extra cost of filling is avoided.

In this I have in mind those farmers who desire to store from twenty to seventy-five tons of this food, rather than the men wishing for hundreds of tons, and as the former class are a hundred times more numerous than the latter, and also more seriously need the advantages which ensilage bring, I think I am justified in planning and executing the experiments especially from their point of view.

The first year our silo was weighted with six tons of sand; this had to be thrown up to the top and again thrown down. The question arose, "Is it necessary to weight?" The past year no weight was put on, only loose straw was thrown on to cover the last corn. The result was entirely satisfactory, there being no waste worth mentioning. On a small silo, especially if it was not to be opened for use until midwinter, or until December 20 even, I should advise moderate weighting with muck or sand, the same to be used as an absorbant after its removal from the silo.

The discussion of the relative value of the ensilage as compared with hay and dry corn fodder will be undertaken in a later Bulletin, and in conclusion let me add, that, in my opinion, every farmer in our State to-day should carefully investigate the merits of preserved green food for his stock. So far as my experience has taught me anything in this connection, it has been that the cost of keeping stock may be reduced from one-third to one-half by a judicious use of ensilage. The truth of this each farmer must demonstrate for himself, and it can be done, or commenced, this year as well as next. The experiment need not be costly, the results may be of great value.

G. H. WHITCHER, *Director.*

Hanover, N. H.

NOTE.—We are now preparing a list of names to whom all the Bulletins of the Station will be sent free, and we hope all who desire to become receivers will send their addresses on a postal card, and also the name of any other farmers in their vicinity.

G. H. WHITCHER, *Director,*

New Hampshire Experiment Station, Hanover, N. H.

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